DOCUMENT RESUME

ED 071 211 EC 050 281

TITLE	Educational Research, Development, and Reference Group Report on Research and Development Activities -- Fiscal 1972.
INSTITUTION	American Printing House for the Blind, Louisville, Ky. Dept. of Educational Research.
PUB DATE	72
NOTE	29p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Annual Reports; *Exceptional Child Research; *Instructional Materials; *Material Development; Research Projects; Tactile Adaptation; *Visually Handicapped

ABSTRACT

The annual report of the Educational Research, Development, and Reference Group at the American Printing House for the Blind summarizes research and development activities conducted during fiscal year 1972 and those planned for fiscal year 1973. Reviewed is progress on individual projects in five major areas: aural study systems for the visually handicapped, basic research in tactual perception, braille codes pilot project educational and instructional materials research and development supported through the Instructional Materials Reference Center, and bibliographies. Also listed in the report are collaborating agencies, publications, research and development personnel, and consultants. (KW)

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ED 071211

Educational Research, Development, and Reference Group

Report on Research and Development Activities - Fiscal 1972

Our educational research and development program continued on a broad scale with projects in the areas of reading, science, mathematics, social studies, listening, educational materials use, braille codes, language development, sensori-motor readiness, and tactile perception. Three years of experience with our broadened program has pointed up our need to more clearly define our objectives and the paths to their attainment. Emphasis will be placed on this task during Fiscal 1973.

During this year, we adopted the system of management by objectives. This procedure should allow for more efficient planning and budgeting in ensuing years as well as allow for allocations of more realistic workloads. Greater emphasis was given to quality control functions during the year. Review procedures were sharpened and quality of evaluation procedures improved. Greater time allocated to evaluation procedures as well as loss of critical personnel impeded our attainment of goals set for the year.

We continued to expand our data analysis capability. Major assistance from the Data Processing Department by Mr. Robert Haynes and Mr. John Siems enabled us to add significantly to our library of statistical programs for our computer. In addition, we purchased a high-speed programmable calculator which enables an unskilled user to carry out a wide variety of statistical tests rapidly, efficiently, and with a minimum of instruction.

Interaction between the research staff and the field reached its highest peak. More than 35 teachers or other educational experts contributed to our projects through intensive consultation. Members of the research staff described our activities at national and regional meetings of the Association for Education of the Visually Handicapped and Council for Exceptional Children. Two papers describing the program were presented at the International Conference for Education of Blind Children and Youth. Individual staff members gave a number of invited addresses throughout the nation and several professional papers were published.

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Progress in Specific Research Activities

In the progress descriptions that follow, the project leader and assistants are identified at the end of each project. Before describing progress on individual projects, the significant contributions of Ken Coy, our educational materials development technician to most projects, should be acknowledged. Mr. Virgil Zickel and various personnel from our plant have participated widely in materials design. Mr. Glenn Scheurich and his staff in the Talking Book Department have been actively and constructively involved in all projects involving recordings. Miss Marjorie Hooper and her staff of the Editorial Department made major contributions to the Braille Codes Pilot Project as well as to other efforts.

A. Aural Study Systems for the Visually Handicapped

This project was funded through the U. S. Office of Education, Bureau of Education for the Handicapped. All specific aims set forth in the original grant application have been met. These included behavioral studies of learning through listening, a task analysis of the job of learning through listening, and the building of an Aural Study System specifically designed for use by the visually handicapped which was subsequently field tested. Additionally, steps have been taken to apply information acquired through this project to recording equipment currently being produced by the American Printing House for the Blind (APH). Carson Nolan has served as director of this project. Those who worked with him during Fiscal 1972 were June Morris; Roy Brothers; Roger Huff; Bob Phelps, the project engineer; and John Brockman, recording engineer.

Research Conducted during Fiscal 1972

1. System development and evaluation report

The write-up of the development of the Aural Study System was undertaken during Fiscal 1972. This report will be submitted to the Office of Education as Interim Progress Report No. 9 when it is completed. The report will include the background of the Aural Study System, the way in which its specifications were determined, a thorough description of the first model of the system and the modifications resulting from its critique and in-house review, a report of the cost of building the equipment, and a report of the field test of the system. Additionally, the problems of textbook format and editing, as they relate to recorded editions of textbooks, will be discussed.

2. Manual on how to listen more effectively

One of the primary goals of the Aural Study System project was to provide a manual for use by visually handicapped students containing information on how to study from recorded material. Work on this manual commenced during Fiscal 1972. Information for such a manual was acquired from interviews with visually impaired students who traditionally studied from such materials, from research on listening, and from general "How to Study" manuals. Plans are to record the manual. Such things as suggestions

on how to anticipate the message by selectively reviewing specific parts of the book, how to take and organize notes, and how to use personal readers both for help in studying and in making personal recordings will be included. Currently, no such information is directly available for students who study aurally.

3. Reference study

The single most unique and positive feature of the Aural Study System is its indexing capability. It makes possible rapid location of any desired place within a text. This feature makes the Aural Study System appear to be ideally suited for presenting reference material. Two problems with reference materials in large type and braille are that they are cumbersome to use and require a tremendous amount of storage space. For example, in regular ink print the Thorndike-Barnhart Junior Dictionary is contained in one volume of 784 pages. The large type edition requires 11 volumes plus a pamphlet and contains 3344 pages. The braille edition is even larger. It requires 22 volumes and contains 4624 pages. By contrast, estimates are that the entire dictionary could be contained on about 40 12-inch records. These could be stored in less than four inches of space.

In order to test the feasibility of using the Aural Study System as a means of presenting reference materials, two 120 minute selections were recorded. One is from the Thorndike-Barnhart Junior Dictionary and the other is from the World Book Encyclopedia. In both cases indexing cues are alphabetical in nature. Two versions of the dictionary selection were made. The content of both is identical but the indexing information contained on the index track varies. These materials will be field tested during Fiscal 1973.

Research Planned for Fiscal 1973

4. System development and evaluation report

This report will be completed and published. It is being written by June Morris.

5. Manual on how to listen more effectively

This manual will be completed, recorded, and distributed. Roy Brothers and Carson Nolan are authoring it.

6. Reference study

Use of the recorded selections from the dictionary and encyclopedia will be compared with use of their written counterparts in a field test of the materials. Subjects will include legally blind students from grades 4-12. These students will be given training in use of the Aural Study System and be given a review in the nature of and use of the two reference works. Then, their performance will be compared in terms of time and accuracy when using the recorded and written versions of these materials. The purpose of this study is to determine the more efficient mode for presenting such materials. June Morris is responsible for this project. She will be assisted by Anthony Biacchi.

B. Basic Research in Tactual Perception

Research Conducted during Fiscal 1972

1. Scanning strategies and techniques in reading and interpreting graphic tactual displays

The purpose of this study was to determine what strategies and techniques experienced adult blind users employed in reading tactual maps. Twelve blind adults were sent a tactual pseudomap and asked to perform three map reading tasks; namely, to locate five point symbols on the map, to locate six areal symbols on the map, and to follow a dotted track on the map from a starting point to a predetermined goal. While performing these tasks, they were asked to describe their hand and finger techniques. This description was recorded over the telephone. The results showed that the 12 subjects used a variety of strategies in locating the areal and point symbols on the map. Some of the subjects used two hands to scan the map while other subjects used one hand as a reference marker along the side of the map while the other hand scanned the map for the symbols. In all, seven distinctive scanning techniques were described.

For the remaining task of following the dotted track, there was marked consistency between subjects in the technique used. The basic technique was to use two hands. One hand followed the track while the second hand trailed behind acting as a reference marker. Additional information was obtained on hand and finger utilization, orienting maps and frames of reference, measuring and estimating distance, size and shape discrimination, the use of keys, and possible activities for teaching map reading. This research was carried out by Edward Berla'.

2. Training blind students to scan a tactual map

The purposes of this study were three-fold. First, to determine if a brief period of training students on how to systematically scan a map would improve performance beyond that of a group not so trained. Second, to determine which of several different map scanning strategies was the most efficient and accurate from among those used. Three, to determine if use of a reference hand along the side of a map would facilitate the student's ability to locate symbols on the map as compared to a condition in which both hands scan the map. A total of 108 blind students in grades 4-12 participated in the study. Two groups of students were trained to systematically scan a pseudomap using either horizontal or vertical scanning techniques. For each scanning technique, the students were trained to use one hand as a reference marker while the other hand scanned the map and also were trained to scan the map using two hands without the use of a reference hand. A third group of students was not given any training but was required to perform the same task as the trained group. The task consisted of locating as many as possible of 16 target symbols during an eight minute period. The results showed that training was better than no training with students in the vertical scanning condition locating more symbols than students either in the horizontal group or in the control group. In addition, both trained groups were more

systematic and less variable than the control group in terms of errors of duplication. The use of a reference hand only seemed to benefit students using a horizontal scanning technique while students using a vertical scanning strategy performed about equally as well in terms of the number of symbols located with either one hand or two hands. The untrained group, while not being as systematic or locating as many symbols as the other groups, did take significantly less time to perform the tasks than the trained groups. This project was carried out by Edward Berla' and June Morris.

3. Methods of shape discrimination

A series of studies was conducted to determine and compare the effects of different methods of discriminating tactual shapes upon the accuracy of discrimination performance. A total of 140 students in grades 2-6 participated in the studies. The students were presented with two raised line shapes which varied in type of configuration and complexity. Half of the comparison pairs were identical and half were different. Each student was presented with a pair of shapes and asked to determine whether the shapes were the same or different. Different groups of subjects were required to inspect the pairs of shapes using one of several different methods of exploration.

The first of the studies compared discrimination accuracy of the left vs. the right hand of each of the students. The second study compared a simultaneous method of exploration with a successive method of exploration. For the simultaneous method the student was presented with two shapes, one to the left hand and one to the right hand and was required to explore the left shape with the left hand only and explore the right shape with the right hand only. For the successive method of discrimination the student was presented with a shape-pair and required to explore both shapes using only one hand. The third study compared the performance of students using two different successive methods of discrimination. The first method called the "same hand method of discrimination" required the students to explore one shape during an inspection period using only his preferred hand followed by the exploration of a second shape with this same hand. The second method of successive discrimination was called the "alternate hand method of discrimination" in which the student explored the first shape with his preferred hand and the second shape with his non-preferred.

Preliminary results suggest that for a given student there was no difference between his left and right hand in terms of accuracy of discrimination performance. The results also indicate that a successive method of discrimination is more accurate than a simultaneous method of discrimination. Since the data analysis is not yet complete the tentative nature of these conclusions should be emphasized. The analysis will be completed and a final report written during Fiscal 1973. This research was carried out by Edward Berla' and Marvin Murr.

Research Planned for Fiscal 1973

4. Stimulus legibility and symbology

One problem in tactual perception is the lack of knowledge about the variables which determine the legibility of tactual symbols. Consequently, there is a relative scarcity of discriminable tactual symbols to be used for embossed diagrams and maps. Research in this area has mainly focused on attempts to identify from among ink-print symbols those symbols that are most discriminable when embossed for tactual reading. This year research is planned to identify the variables and methods which may lead to principles for constructing symbols. Previous research at APH suggested that for tactual perception the most relevant dimensions are the following: continuous vs. interrupted, regular vs. irregular, thick vs. thin, single vs. double, rough vs. smooth, and high vs. low. Systematic combinations of these dimensions in different configurations may result in patterns that are highly discriminable. Thus, the proposed research will focus on the nature and number of dimensions that will produce discriminable symbols. This research will be planned and conducted by Edward Berla' who will be assisted by Marvin Murr.

5. Map scanning techniques II

The proposed project is similar to the one conducted in Fiscal 1972. Students in grades 4-12 will be trained to scan a tactual pseudo-map using one of three different techniques. The three scanning techniques will be: (a) one hand horizontal scan--one hand will be used as a reference marker along one side of the map while the other hand will scan the map from left to right or right to left locating the target symbols, (b) two hand vertical scan--the two hands will be placed at the top of the map next to each other and both hands will scan the map in columns, and (c) two hand assymetrical scan--one hand will be placed on the top left side of the map and the other hand will be placed on the top right side of the map; the hands will then scan horizontally toward the center of the map until they meet in the middle. Once the hands meet in the middle, each hand will be returned to its respective side of the map and the next horizontal row of the map will be scanned. The students' task will be to locate as many of the 16 target symbols as possible in an eight minute period. The design of the study will consist of pretesting all students on their ability to locate the symbols before training them to use a specific technique. One group of students will not be given any training. This group will serve as a control group and will be asked to perform the same task as the training groups.

The map for this study will be made more difficult than the map used in the previous scanning study by incorporating areal symbols as well as point and linear symbols. The students' performance will be evaluated in terms of three measures: the number of symbols correctly located, the errors of duplication, and time on task. This project will be carried out by Edward Berla' who will be assisted by Marvin Murr.

6. Orientation and identification of tactual symbols

Research has shown that blind children have difficulty in identifying tactual figures on the basis of their orientation. This means that blind children have difficulty both in identifying a tactual figure when it is presented in a different orientation and in determining the orientation of a familiar tactual figure. Research reported last year indicated that braille readers are able to reorient tactual figures in space but perform poorly. Consequently, a study will be carried out to determine whether braille readers can be taught to identify figures irrespective of their orientations and/or be taught to identify the orientation of familiar figures. This research will be carried out by Edward Berla' who will be assisted by Marvin Murr.

C. Braille Codes Pilot Project

Research Conducted during Fiscal 1972

1. Pilot study

This project arose as a consequence of deliberations of the Braille Authority and its Advisory Council and their concern with the many braille codes problems in the areas of textbook formats and techniques; maps, charts, and diagrams; mathematics and science; music notation; and computer notation. A grant was obtained from Social and Rehabilitation Service to explore the feasibility of organizing a major research and development program to solve the codes problems. APH was requested to undertake this study.

The procedure employed in the study was to organize small working groups of experts for each of the five areas. During an initial meeting of each group, attempts were made, through group discussion, to pinpoint specific code problems. Following the meetings, recorded transcripts were analyzed to provide lists of problems ordered by logical categories for each area. These lists were sent to the appropriate group members for study. A second meeting of each group was held and the problem lists critiqued and expanded. These activities were accomplished during Fiscal 1971.

During Fiscal 1972, these problem lists were recompiled on the basis of the outcomes of the second set of meetings. Problems within areas were interrelated between areas to arrive at an overall list of research problems categorized in terms of relevant factors.

Among the many results of the study was identification of approximately 838 code problems in all five areas. Approximately 160 of these problems were of a perceptual nature requiring sequential long term research. Of the 678 problems, 625 appeared solvable through short-term efforts, principally through methods involving expert judgment. Cleves Kederis and Carson Nolan were responsible for this project.

Research Planned for Fiscal 1973

2. Braille codes refinement and expansion

The purpose of this project is to refine and expand the braille codes for textbook formats and techniques, mathematics and science, music, and computer notation. This development will concentrate on the specific problems in these areas identified through the Braille Codes Pilot Project and will follow procedures suggested in the report for this project and by the Braille Authority and its Advisory Council. These will involve the use of concensus of opinions of groups of experts supplemented with some empirical research to solve approximately 500 code problems identified through the previous research as amenable to short-term solutions. The results of the project will be published as addenda to present code books or will be incorporated in revisions of these. The initiation of this project, which is projected for a four year period, is contingent upon approval of a proposal to the Social and Rehabilitation Service, HEW.

D. Educational Materials Research and Development Supported through the Instructional Materials Reference Center (IMRC)

For several years, a grant from U. S. Office of Education has supported a variety of educational materials development activities as well as educational materials reference services. The following projects received support from this source.

1. Science program

Educational Materials Development during Fiscal 1972

a. Primary science laboratory

This laboratory was initially conceived as a set of from 15-20 items. However, the number of aids actually identified for development or adaptation was fewer than originally anticipated. Consequently, it appeared desirable to consider each aid as an individual project as reported below to facilitate development, manufacturing, and distribution.

The pull-apart cell is an analog presenting tactually the component features of a plant and/or animal cell as it appears in simple drawings in elementary life science textbooks. No such model suitable for use by blind students is known to exist. Further evaluation of this device is required.

The insect identification kit was designed to teach body parts of insects. It also provides an opportunity for the student to observe and to note differences and likenesses in insects. The kit is supplementary to the numerous illustrations in primary grade science texts. An advantage of use of the kit is its immediate availability in a climate and/or time when attempts to obtain live insects might be futile. Evaluation of this kit is complete.

The dial thermometer familiarization unit introduces the component parts of the APH tactile dial thermometer to primary grade students. Starting with grade one, numerous operations using the thermometer are introduced in the science curriculum. Since the tactile dial thermometer included in the Science Measurement Kit was designed for older students, the need for a short training unit to teach the use of this thermometer to young blind students was recognized and has been developed. Further evaluation is required.

Introductory simple machines are needed for teaching basic physical science concepts. A search through catalogs of educational aids from commercial and specialized suppliers yielded one set of simple machines suitable for very young students. This set of simple machines was subsequently acquired for inspection and preliminary adaptations proposed. Currently, these design modifications are being considered by an APH research and development review committee. Subsequent decisions will be made regarding the extent to which the introductory simple machines will need to be modified for use by young visually handicapped students. A progress report summarizing the activities of the development phase of this project has been completed. Frank Franks and Anthony Biacchi conducted this work.

b. Three dimensional biological models

Last year a pilot study was conducted to determine the feasibility of developing a set of three dimensional biological models (invertebrates and plants). Initially a set of 12 invertebrate models (schematics) depicting the major morphological features of major invertebrate phyla was developed. Each schematic was vacuum formed in plastic and coded tactually and chromatically. Typical schematics were selected for pilot testing. Results of the pilot testing showed that the various model parts were highly discriminable to visually handicapped students.

A textbook analysis of biological models (plants) was conducted to identify the plant structures illustrated in junior and senior high biology textbooks. Several representative plant structures (root cross-section, root tip, leaf cross section, lower leaf epidermis, bean seed, and woody stem) were selected to be included in the set of biological models.

Eighteen schematics (12 vertebrates and 6 plant structures) were pilot tested using legally blind secondary students. Generally, these schematics were found to be discriminable. However, several prototype modifications were suggested and were made prior to formal testing. A field evaluation of 19 schematics (a flower schematic added) was conducted to determine if blind secondary students could identify the various structures illustrated. Preliminary analysis of these data shows that the biological structures represented are highly discriminable. Frank Franks was project leader on this study with Anthony Biacchi and Marvin Murr conducting the testing.

c. Institute on introducing basic science concepts to primary grade visually handicapped students

The institute was held to inspect component parts of the primary science laboratory, to examine concept areas in science where deficits are believed to exist, to identify aids for introducing specific concepts at the primary level, and to suggest priorities for developing the instructional aids necessary for completing the laboratory.

The pull-apart cell, the insect identification kit, and the dial thermometer familiarization unit were reviewed and subsequently endorsed by the institute. Participants especially liked the pull-apart cell and recommended the development of additional pull-apart models. Additional laboratory components suggested were the light probe, additional plant models, and a rain gauge. The light probe was designated as the single highest priority item to be included in the primary science project. Other high priority aids suggested for development include an ecology unit, educational materials relating to family life and human development (sex education), models depicting the stages of metamorphosis, and an improved braille compass. Frank Franks was institute organizer. He was assisted by Roger Huff and Anthony Biacchi. Persons participating in the Institute are named at the end of this report.

Educational Materials Development Planned for Fiscal 1973

d. Introductory simple machines

This set of simple machines; including the lever, the inclined plane, the pulley, and the wheel and axle, will be evaluated. Further adaptations and the evaluation design for field testing will be suggested by an APH research and development review committee. Frank Franks is the project leader on this study. He will be assisted by Anthony Biacchi.

e. The light probe

A feasibility study to determine whether the light probe can be used to perform a variety of simple chemistry-oriented experiments at the primary grade level will be conducted. A number of educators believe that the light probe can provide the non-vision student direct interaction in a number of concept areas which at present are not available to him. Light probes will be sent to six primary science teachers for evaluation. The participating teachers will be requested to specify simple experiments and concept-oriented activities which their students have been able to perform. Frank Franks is project leader.

f. Pull-apart cell

Further evaluation will be accomplished by Roger Huff.

g. Dial thermometer familiarization unit

Further evaluation will be completed by Roger Huff.

2. Mathematics program

Educational Materials Development during Fiscal 1972

a. Primary mathematics laboratory

Several sets of aids for introducing basic mathematics concepts to young visually handicapped students have been developed under the project title of primary mathematics laboratory. As in the case of the science materials, it subsequently has been decided to consider each aid as an individual project to expedite development and distribution.

The fractional parts of wholes prototype was designed as a tactile analog to parallel educational materials available to sighted students. As a result of last year's pilot testing, modifications were made in the evaluation plan. Field testing was conducted to determine if primary level (K-2) tactile learners could successfully manipulate and discriminate the component parts of the aid. The results of the testing indicated that primary level students could successfully manipulate the fractional parts of wholes and discriminate a majority of the fractional comparisons presented in the evaluation. The project has been reviewed and a final report has been prepared. This evaluation was completed by Roger Huff and Frank Franks.

The original purpose of the tactile ruler unit was to evaluate primary grade students' ability to discriminate and identify the tactual symbols on the inch scale of the tactual ruler and to teach students to perform simple operations in linear measurement. The results of pilot testing indicated that the young visually handicapped students tested had difficulty discriminating the one-fourth inch distances. Consequently, the materials were redesigned this year to overcome this problem. Roger Huff supervised this work.

The geometric forms unit was designed to introduce the shapes of triangles, squares, and circles which are represented in the primary mathematics curriculum as curves, tangible plane figures, and three dimensional figures. Prototypes of the geometric forms have been developed and pilot testing of these materials has been conducted. Results of the pilot testing indicate that further evaluation of these geometric forms is warranted. Roger Huff conducted the pilot testing.

b. Compass and protractor; 3-dimensional coordinate aid

These projects were included as research and development strategies for Fiscal 1972. The loss of a staff member resulted in a shifting of strategy assignments. Project development priorities subsequently changed causing these two projects to be deferred indefinitely. There is no progress to report on these two projects.

c. Arithmetic computation: Achievement levels of visually handicapped students in public schools

The purposes of the study were to determine current achievement of visually handicapped students in the area of arithmetic computation, to

determine the devices or strategies being used by the students, and to note any relationship between the device and the level of achievement.

Forty-two independent school districts in 10 states participated in the study. Approximately 37% of the 263 students used braille as their reading mode. Appropriate levels of the Stanford Achievement Test, Form X, Arithmetic Computation were administered to students in grades 4, 6, and 8. Achievement scores were higher than those reported for residential school students, and the mean IQ scores of the present sample were 2 to 10 points higher at respective grade levels.

Achievement scores were significantly below expected levels. Mean grade scores were 2 to 9 months below expected grade level, and the percentage of students scoring below the median in grades 4, 6, and 8 were 60%, 67%, and 61%, respectfully.

Use of the abacus was limited. It was not used by large type students in grades 6 and 8 and was used by only a relatively small percentage of braille students (i.e., 9% of the fourth graders, 3% of the sixth graders, and 3.5% of the eighth graders). Braille students appeared to rely heavily upon the braillewriter and cubarithm slate and cubes. Large type students generally used pencil and paper for computational purposes. Mean achievement scores of the two groups were not significantly different. This research was conducted by Roy Brothers.

d. Programmed instruction as a means of teaching addition and subtraction on the abacus

Development and evaluation of programmed instruction to teach addition and subtraction on the abacus was the goal of this project. A series of 45 lessons in programmed format was developed for this purpose. However, it was found impossible to provide for individualized independent use of the program by the student. Instead a tutorial approach was necessary to teach the program for evaluation. The trial use of the program proved moderately successful. The completed program should be useful as a guideline to teachers. This project was conducted by Suella McCrimmon.

Educational Materials Development Planned for Fiscal 1973

e. Tactile ruler

Additional evaluation of this project has been proposed. Roger Huff will conduct this research.

f. Geometric forms

Field evaluation procedures for this project will focus on refining the evaluation design, refining the instructional program to be used, and evaluating the instructional effectiveness of this aid. Roger Huff will conduct this research.

3. Social studies program

Educational Materials Development during Fiscal 1972

a. Introductory map reading materials

The purpose of this project is the development of materials which will assist the young visually handicapped student in the attainment of a map concept (i.e., how the environment can be represented abstractly in the form of a map) and to familiarize him with some of the fundamental characteristics of maps. The need for such materials was identified in an APH report of a five year study on improvement of tactual symbols for blind children.

Simple relief maps of increasing difficulty which present geographical features commonly illustrated on introductory maps have been developed. The contents of these maps are a result of inspections of various social studies textbooks and map reading materials to determine the kinds of maps first introduced in the curriculum, the concept-related activities introduced at the primary grade level, the sequence of introduction, and the appropriate vocabulary used at the primary grade level. The relief maps are curriculum-based analogs which present the same kinds of information found on introductory maps in primary grade level texts. The maps expose the student to physical (e.g., hill, river, tree) and cultural (e.g., house, church, school) geographical features representative of a typical environment, introduce spatial relationships as simple locational referents (e.g., far, near, left, right, between), and provide general map orientation using cardinal (e.g., north, south, east, west) and intermediate (e.g., northeast, southwest) directional referents.

An instructional program was prepared and together with the relief maps was reviewed within APH as well as by teachers attending an Institute on Map Reading for Primary Grade Visually Handicapped Students. The instructional program was subsequently revised and a pre- and posttest was developed. These materials, along with the relief maps, again are being evaluated for testing by an APH research and development review committee. Frank Franks is project leader. He is assisted by Anthony Biacchi.

b. Simplified continental relief maps

The purpose of this project is to develop simplified continental relief maps for use by primary grade visually handicapped students. Specifically, the study focuses on physical geography--identification of the most prominent geographical features on continents. A simplified continental relief map of North America was developed for use as a working model in exploring the feasibility of developing maps of other continents. These maps are being explored as analogs to present tactually the kinds of information which is presented visually on maps appearing in the primary grade social studies curriculum.

A working paper on prominent geographical features which appear on continental maps has been prepared as an aid in the development of simplified continental relief maps. The report includes an analysis of prominent geographical features of the continents which appear in the primary social studies curriculum, student identification sheets which may

be of value in testing or teaching the identification of continents and the location of prominent geographical features, and instructional units (grades 1-3) using the continental relief map of North America which may give the educator an idea of how such maps can be used to expand the use of the globe and introduce the use of continental maps into the primary social studies curriculum for young visually handicapped students.

The Institute on Map Reading for Primary Grade Visually Handicapped Students reviewed the project and made constructive comments. A project draft, a mock-up of a simplified continental relief map of North America, and a student identification sheet have been prepared for in-house review. Frank Franks is the project leader. He was assisted by Liborio Albano.

c. Institute on map reading for primary grade visually handicapped students

The Social Studies Institute focused on deficits in map reading viewed in terms of needs across the social studies curriculum, with emphasis on the introductory or primary grade level. The institute was asked to review the APH introductory map reading project and the simplified continental relief map project.

Other curriculum areas in social studies also were examined to determine where deficits in instructional materials are believed to exist for visually handicapped students, to identify specific aids necessary for teaching basic concepts in these areas, and to suggest priorities for development of relevant educational aids and materials.

The introductory map reading projects reviewed by the institute were supported in content and approach. Participants emphasized that there is an immediate need for these aids since materials which teach the concepts introduced are not available for young visually handicapped students.

The institute recommended that APH braille atlases be improved, that individual desk-size outline maps be developed, and that the utilization of cassettes for appropriate instructional materials should be considered. The development of educational models which can be used in conjunction with real features and items in the environment was recommended. Frank Franks was institute organizer. He was assisted by Anthony Biacchi and Roger Huff. Persons participating in the institute are identified at the end of this report.

d. Analysis of map content in fourth grade social studies textbooks

An analysis of maps in social studies textbooks was conducted to guide future development of map reading materials. The variety and the type of physical and cultural symbols found at the fourth grade level were reported. The analysis listed the number of specific symbols (e.g., areal, linear, and point) and the items (e.g., symbols plus keys, scale of miles, etc.) on individual maps. The content (e.g., political, physical, etc.) of the maps and the most frequently appearing symbols were also noted. Anthony Biacchi conducted this analysis.

Educational Materials Development Planned for Fiscal 1973

e. Introductory map reading materials

The introductory map reading materials described in 3a (above) will be field tested. Frank Franks is project leader and will be assisted by Anthony Biacchi.

f. Simplified continental relief maps

The simplified relief map described in 3b (above) will be completed and field tested. Frank Franks is project leader on this project.

4. Materials for the multihandicapped visually impaired

Educational Materials Development during Fiscal 1972

a. Adaptation of the "Listen and Think" materials

These materials were designed to provide taped lessons for the development of listening and thinking skills. Level C of this program by Educational Developmental Laboratories (A Division of McGraw-Hill) was completed and is now in production. Level F was adapted and field tested. Master tapes for Level F are now ready to be submitted for production. The adapted lessons incorporate the ink-print workbook activities into the recorded tape and utilize a simple answer sheet format for student response. Fay Leach was responsible for this project.

b. Readiness aids

Eight readiness aids were evaluated during the past year: Revisions based on field testing of the simple textured block were completed and a prototype was submitted for production. These blocks are designed with three simple textures and three colors. A frame is provided to assist in manipulation skills. Field testing of the large button aids and the buckle aid did not give sufficient support for production of these aids. The enlarged size increased manipulation problems for some children and for others training on this size failed to generalize to the dressing skills desired. Model revisions have been made in a peg set and a sensory-cylinder set. Both items deal with basic sensory discrimination. Further testing, refinement, and review is needed on the peg set and sensory-cylinders. Due to the availability of similar items on the commercial market, work on the directional concept board and the wagon was discontinued. The take-apart doll is to be reconsidered when information is available from additional testing. This work was directed by Fay Leach.

c. Survey of materials for the development of elementary readiness skills

An 87-page report entitled "Commercially Available Instructional Materials for Use in the Development of Elementary Readiness Skills in Young Visually Handicapped Student" was compiled. Nearly 2,000 copies had been distributed by August 1972.

In cooperation with the Area Center for Services to Deaf-Blind Children, Callier Hearing and Speech Center, Dallas, Texas and with the assistance of the Aduio Visual Department of the Louisville Public Schools, two copies of a set of video tapes on sensory stimulation have been made and will be available for dissemination. These tapes deal with both theory and actual demonstration of the use of instructional materials. One set of tapes is compatible with the new (EIAF) 1/2 inch Sony and the other is compatible with the old standard 1/2 inch Sony. Fay Leach coordinated these activities.

d. Instructasette System, Biodynamics,Inc.

This device, a cassette player which has been modified to play and record audio cards without greatly increasing its cost, was examined. The examination revealed limitations in the uses and durability of the system. Due to changes in the organizational structure of this company, a cooperative endeavor in the development of audio-card software became no longer feasible. Machines from three other companies were examined and found much superior in quality. The prices of the other available audio card readers are much higher than the Instructasette system. Experimentations revealed that software could be designed which could be used on all four devices. Fay Leach conducted this evaluation.

e. Exploration of the feasibility of the development of an instructional materials manual on elementary auditory and oral language skills

A survey of materials was made and included in the published listing of elementary readiness materials (see 4c above). Curriculum guides have been collected and contacts have been made with persons working on curriculum materials. Two curriculum guides from organizations working with visually handicapped children are scheduled for completion within the next few months. Final evaluation of the need for a materials manual in view of available materials is to be made in a workshop to be organized during the coming year by Fay Leach.

Educational Materials Development Planned for Fiscal 1973

f. Basic auditory and oral language skills

Two additional units of Educational Developmental Laboratories "Listen and Think" taped lessons are to be adapted. A workshop is to be planned and conducted. This workshop is to be designed to bring together a team of consultants for the purpose of identifying specific problems and needs in the development of basic auditory and oral language skills, outlining goals for meeting these needs and problems (identifying priorities), identifying instructional materials which need to be adapted or developed, and reporting on materials which are available and have proven to be valuable for visually handicapped children. Fay Leach will organize this workshop with the assistance of Tony Biacchi.

g. Sensory-motor readiness materials

Monitoring of commercially available materials will be continued in preparation for a 1974 revision of the 1972 elementary materials listing. Development and testing of the sensory-cylinders and peg set are to be completed. A guide for use of these latter materials is to be written. Development of a set of audio cards designed for building basic readiness skills will be explored. This work will be directed by Fay Leach with assistance from Tony Biacchi.

5. Primary braille reading materials

Educational Materials Development during Fiscal 1972

a. Developmental reading readiness program

During the last two years, research personnel have worked with Ina Kurzhals and a group of consultants to formalize her developmental reading readiness program for field use and review. This program consists of a teachers guidebook which explains the origin, philosophy, and methods for implementing the program; 66 sample lesson plans to guide teachers in using the materials effectively; and a set of tactual readiness books to be used by students. During the 1972 fiscal year, the textbook and lesson plans were written, copies were made and placed in the field for review by experts, and the reviews were returned to APH. Revisions based on these reviews will be made. The revised materials will consist of the guidebook, a set of seven small pamphlets containing an introduction to the lesson plans, the lesson plans, and instructions for making the tactual readiness books which cannot be produced by the Printing House. Preparation of these materials for review was completed by Ina Kurzhals and Hilda Caton with the assistance of Eleanor Pester. Consultants in this project are listed at the back of this report.

b. Analysis of pre-primers and primers

Pre-primers and primers of four basic reading series were analyzed in order to identify concepts presented and to identify reading skills and braille skills for which readiness worksheets are needed. Data from these analyses were used to identify objects needed to present beginning reading skills, to illustrate concepts or replace illustrative materials. The analyses were completed by members of the primary braille reading consulting group and coordinated by Hilda Caton and Cleves Kederis.

c. Development of an object collection

Based on the textbook analyses mentioned above, a set of approximately 200 objects was collected and appropriate housing was designed for the collection. The objects were chosen on the basis of their applicability to the four series of textbooks analyzed. Suggested adaptations of lesson plans using the objects as teaching aids were written to assist teachers in using the collection appropriately. Work on this project was completed by Hilda Caton, Cleves Kederis, and Sara Schell.

d. Development of worksheets

Data from the textbook analysis was also used to identify specific braille areas in which worksheets were needed for drill and reinforcement. Lesson plans from the pre-primer and primer workbooks of each of the four textbook series were adapted in order to determine the feasibility of developing worksheets in this manner. Work on this project was done by Hilda Caton, Cleves Kederis, and Sara Schell.

e. Primary braille reading institute

Members of the primary braille reading consulting group, which was formed during the primary braille reading institute held in 1970, participated in a second institute held at APH during the latter part of Fiscal 1972. The purposes of this meeting were to review recommendations for the development of primary braille reading materials made at the 1970 institute, evaluate progress made by APH toward the implementation of these of these recommendations, make recommendations regarding plans for future development of these materials, and set priorities for their development.

The group strongly recommended that the Printing House continue development of materials recommended by participants in the 1970 institute. They reviewed materials now under development and made recommendations for revisions which are being implemented. They also set the following priorities for completion of these materials: First, completion of the braille reading readiness program designed by Ina Kurzhals; second, completion of the development of a collection of objects and accompanying manual for teachers to teach beginning braille reading; and third, completion of a set of worksheets designed to provide drill and reinforcement in overcoming problems created by difficulties inherent in the braille code. The institute was coordinated by Hilda Caton. The participants are listed at the end of this report.

Educational Materials Development Planned for Fiscal 1973

f. Developmental reading readiness program

Revision of the reading readiness materials now in progress will be completed in December 1972. The materials will be placed in the field for expert review early in 1973. The completion of the review is projected for April 1973. Additional revisions will then be made. Completion of development of the materials is expected during the summer of 1973. Further development will be supported by other sources than the IMRC. Project leader is Hilda Caton.

g. Development of object collection

The collection of objects and the first draft of the manual of suggestions for teachers will be reviewed by expert teachers in late 1972 at which time suggestions for revisions will be made. The collection of objects will be reviewed in terms of the suitability of the models included and unsuitable objects will be replaced. The manual of suggestions for teachers will be reviewed in terms of its usefulness in helping teachers present reading skills to visually handicapped children and in terms of

its applicability to more than one reading series. Following this review, revisions will be made and the complete set of materials will be placed in the field for evaluation early in 1973. The projected date for completion of the evaluation is April 1973. Hilda Caton is project director.

h. Development of worksheets for tactile reading readiness

A review of available materials for developing the tactile skills to facilitate braille character discrimination will be completed in January 1973. Specifications for worksheets to provide drill and reinforcement in tactile tasks of increasing complexity and difficulty will be written during February 1973. Worksheets will then be designed and plans for evaluation will be made. Hilda Caton and Tony Biacchi will attempt this development.

6. Other IMRC educational materials research and development

Educational Materials Development during Fiscal 1972

a. Identification of teacher competencies needed for the education of visually handicapped children

The purposes of the study were to determine special competencies needed by teachers of visually handicapped children and to explore training strategies that would assist in the development of these competencies.

A survey approach was used to determine areas of needed competencies. Questionnaires were developed in two forms; one for the administrator and one for the classroom teacher. The items on the questionnaires were reviewed and revised before being distributed to a total of 76 programs. Questions directed to the administrator focused on teacher competencies in the areas of reading, mathematics, science, and social studies instruction. A separate section concerned with listening skills, utilization of low vision, and problems in educational diagnosis was included. Questions directed to the teacher group focused on recent inservice training experiences, the types of information found especially useful, and the type of training or information dissemination that would be more helpful.

Thirty-three or 43% of the administrators returned the questionnaire. In addition 116 of their teachers also responded to the teacher's form. A list of needed competencies were identified for each area of instruction as well as the listening, low vision, and diagnostic aspects of instruction. Each list contained anywhere from 50 to 65 individual responses. The listings were highly variable with no strong grouping of related skills emerging in any one area. One exception might be in the area of mathematic instruction where 26% of the total responses were concerned with developing the teachers ability to use and to teach the use of the abacus.

At the present time no formal plan has been adopted which will satisfy the second purpose of the study, namely, the identification of training strategies that would assist in the development of needed competencies. Roy Brothers was responsible for this study.

b. Listening strategies for perceptual motor learning; the development of sound localization skills

The development of sound localization skills by young visually handicapped children is related to characteristics of the sound source, how the sound source is used, and the sequential progression of activities that are adopted. The portable audible goal locator (PAGL) produced by APH is one device identified as having most of the characteristics desired in a stimulus sound for teaching localization skills. The PAGL provides for a varied volume, pitch, and signal frequency. The sound is easily directed and the device is highly portable.

The purpose of the study was to determine how the PAGL was being used by orientation and mobility specialists and classroom teachers and to develop a manual for teaching sound localization skills which would incorporate the use of a sound source such as the PAGL.

A questionnaire was distributed to 217 orientation and mobility specialists and classroom teachers regarding their use of the PAGL and the specific activities they had used for teaching sound localization skills. Limited information was obtained from the target population. Only 22% of the questionnaires were returned and of these only 28% had either seen the PAGL demonstrated or had used it.

A three day Sound Localization Institute was held at APH in April 1972 for the purpose of reviewing results of the questionnaire and developing a sound localization manual. The manual that was developed was a direct outcome of the institute and describes a variety of activities useful in teaching sound localization skills. A sequential development of localization skills were represented in the suggested activities.

In addition to the manual, the institute participants made several recommendations regarding refinement of the activities, dissemination of the manual, changing the name of the device, and adaptations which would contribute to its greater effectiveness as a sound source for the development of localization skills. This research was conducted by Roy Brothers and Roger Huff. Institute participants are listed at the end of this report.

Educational Materials Development Planned for Fiscal 1973

c. Development of instructional kit for braille code recognition materials

One objective of the IMRC is to promote the efficient use of educational materials having demonstrated utility in the education of visually handicapped students.

In an effort to realize more completely the total resources of the Special Education Instructional Materials Center (SEIMC) Network, the IMRC and the Michigan State University Instructional Materials Center (MUS/IMC) have initiated a joint effort to develop an instructional kit

which will prepare teachers to use the braille code recognition materials developed and validated by Umsted and Henderson. This project will be conducted by Roy Brothers and personnel from the MSU/IMC.

d. Study of the Chang mobility kit

Efforts to delineate appropriate activities and uses for selected educational aids will continue. During the coming year, suggested activities and expanded uses for the APH Chang mobility kit will be explored. Basic information will be obtained from those individuals who have used the aid extensively. Possible modifications will be considered, especially those that would add to its versatility within the classroom. Roy Brothers and Roger Huff will conduct the study.

7. Test adaptation

APH has traditionally provided braille and large type editions of the Stanford Achievement Test series and, along with it, a variety of other batteries of achievement and ability tests. The latest additions were made during 1964 and 1965 when Forms W and X of the Stanford Achievement Test, Form A of the School and College Ability Tests, and Form B of the Sequential Tests of Educational Progress were made available in both braille and large type. In order to provide braille editions of tests, extensive editing is required. This includes the deletion of tests that are highly pictorial in nature and the omission of items from other tests where they are not suitable for braille transliteration. Such items are usually those involving the use of drawings or complicated or three dimensional graphics. The main problem in APH's test adaptation is in providng norms for use with the braille editions. New norms have to be computed for all tests from which items have been omitted. These new norms must reflect only those items appearing in the braille edition and are, therefore, specific to it.

Educational Materials Development Planned for Fiscal 1973

a. Stanford Achievement Test, Forms A and B

Harcourt Brace Jovanovich, Inc. is updating the Stanford Achievement Test series. The new forms (A, B, and C) are to be normed during the 1972-1973 school year. Arrangements will be made with the publisher to have norms computed for the braille editions from their original norming data. The norms for the ink-print editions will be appropriate for use with the large type editions.

During Fiscal 1973 the tests in Forms A and B of the new Stanford Achievement Test series will be edited for braille, braille and large type editions will be produced, and directions for administering both will be written. June Morris and Carson Nolan will be responsible for this project. They will be assisted by Marvin Murr.

b. Test development advisory group

A need has been recognized for professional help in the selection of tests to be produced by APH from among the multitude of tests on the market. In order to meet this need a group of individuals knowledgeable in the use of tests with visually handicapped students will be assembled during Fiscal 1973 to discuss needs in the area and to help identify specific educational measures, beyond those currently provided by APH, for which there is a need. A criterion for selection of these tests is that they be suitable for transliteration into braille. Once such tests are identified, priorities for their production will be established. Carson Nolan and June Morris will be responsible for the assembly of this advisory group and the writing of a strategy report resulting from its meeting. The report will be used as a guide for future test adaptations.

D. Bibliographies

For some years bibliographies on research, testing, and other specific areas such as braille have been published by APH as a service to students, researchers, and other professional people working with or interested in the visually handicapped. Such bibliographies have been periodically updated. References for these bibliographies have accrued through systematic search and documentation of the literature of the field which has been an intrinsic part of the research process. After completion of review of the 1971 literature, it was decided to update four major bibliographies through 1971. Because there now exist abstracting services (Psychological Abstracts, Exceptional Child Education Abstracts, Dissertation Abstracts International, and Educational Research Information Center [ERIC]) which overlap to varying degrees with the Printing House's bibliographies, it is highly probable that these will represent the last editions of these bibliographies. June Morris and Carson Nolan share responsibility for these publications.

Research Conducted during Fiscal 1972

1. Bibliography on Tests and Testing of the Blind

This bibliography is a general bibliography which includes references to articles concerning theoretical or practical aspects of testing; historical development of testing; manuals, instructions, and methods of administration of tests; descriptions and evaluation of tests; the development and adaptation of tests for the blind; and uses of tests where reports are given of results obtained when established tests were used with blind populations. This bibliography contains 419 references.

Research Planned for fiscal 1973

2. Bibliography of Research on the Visually Handicapped

Only references to reports of research on the visually handicapped in which empirical data of some kind were collected will be included in this bibliography. Most of the studies will focus on legally blind

subjects. Medical research on the eye and blindness will be excluded. This bibliography will be supplementary to the general bibliography compiled by Helga Lende and published as Books about the Blind in 1953 by the American Foundation for the Blind. Approximately 1300 references will be included.

3. Bibliography of Research on Braille

The title of this bibliography is self-explanatory. It will included about 130 references.

4. Bibliography of Research on Large Type Reading

As with the previous listing, the name of the bibliography is its own description. As little research has been done on this topic, it will be a short bibliography containing only about 50 references.

Agencies Collaborating in Research during the Year

Fiscal 1972 saw a large number of outside schools and agencies collaborating in our research and development efforts. These included the following residential schools for the blind: Alabama, California, Governor Morehead, Indiana, Kentucky, Maryland, Mississippi, Missouri, New York State, Ohio, Ontario, Overbrook, Perkins, Tennessee, Texas, and Utah.

Public school systems in the following states participated: California--Cupertino, Fairfield-Suisun, Fresno, Kern County, Long Beach, Rowland Heights, San Bernardino, San Juan Unified, Santa Monica, Temple City, Visalia, Yuba County; Florida--Dade County, Orange County, Pinellas County, West Palm Beach; Illinois--Chicago, Rockford; Kentucky--Louisville; Michigan--Battle Creek, Detroit, Flint, Grand Rapids, Jackson, Royal Oak, Saginaw, Warren Consolidated; New York--Board of Cooperative Educational Services--(Jerico, Suffolk County), New York City, West Seneca; Ohio--Canton, Cincinnati, Dayton, Mad River, Parma, Toledo, Willoughby-Eastlake; Pennsylvania--Allegheny County; Texas--Fort Worth, San Antonio; Washington--Tacoma; and Wisconsin--Green Bay.

Publications

Brothers, R. J. Aural study systems for the visually handicapped: Effects of message length: Interim progress report no. 8. Louisville, Ky.: American Printing House for the Blind, 1971. [Project No. 8-0046; Grant No. OEG-0-8-080046-2670(032)] [Also in Education of Visually Handicapped, 1971, 3, 65-70.]

Brothers, R. J. Learning through listening: A review of the relevant factors. New Outlook for the Blind, 1971, 65, 224-231. [Also in New Beacon, 1971, 55, 310-315.]

Brothers, R. J. Arithmetic computation by the blind: A look at current achievement. Education of the Visually Handicapped, 1972, 4, 1-8.

Franks, F. L. Institute report on introducing basic science concepts to primary grade visually handicapped students. Louisville, Ky.: American Printing House for the Blind (Instructional Materials Reference Center), 1972.

Franks, F. L. Institute report on map reading for primary grade visually handicapped students. Louisville, Ky.: American Printing House for the Blind (Instructional Materials Reference Center), 1972.

Franks, F. L., & Baird, R. M. Geographical concepts and the visually handicapped. Exceptional Children, 1971, 38, 321-324.

Kederis, C. J., & Nolan, C. Y. Braille codes pilot project: 1 December 1970--31 January 1972: Final report. Louisville, Ky.: American Printing House for the Blind, 1972. (Grant No. 14-P-55094/4-01)

Leach, F. Multiply handicapped visually impaired children: Instructional materials needs. Exceptional Children, 1971, 38, 153-156.

Leach, F. Commercially available instructional materials for use in the development of elementary readiness skills in young visually handicapped students. Louisville, Ky.: American Printing House for the Blind (Instructional Materials Reference Center), 1972.

Morris, J. E. Aural study systems for the visually handicapped: Effects on aural learning of a prior frame of reference: Interim progress report No. 7. Louisville, Ky.: American Printing House for the Blind, 1971. [Project No. 8-0046; Grant No. OEG-0-8-080046-2670(032)]

Morris, J. E., & Nolan, C. Y. Bibliography on tests and testing of the blind. Louisville, Ky.: American Printing House for the Blind, 1971.

Unpublished manuscripts

Albano, L. G. Prominent geographical features appearing on continental maps. Unpublished manuscript, American Printing House for the Blind (Instructional Materials Reference Center), 1972.

McCrimmon, S. Programmed instruction as a means of teaching blind children addition and subtraction on the abacus. Specialist in education thesis, George Peabody College for Teachers, 1972.

Murr, M. J. Seed plant illustrations in biology textbooks. Unpublished manuscript, American Printing House for the Blind (Instructional Materials Reference Center), 1971.

Research and Development Personnel for Fiscal 1972

Albano, Liborio, MA - EMR&D Assistant (summer)

Berla', Edward, PhD - Behavioral Research Scientist

Biacchi, Anthony, EdM - EMR&D Assistant

Brothers, Roy, EdD - Behavioral Research Scientist

Caton, Hilda, Ed. Spec. - EMR&D Specialist (part-time)

Coy, Ken - EMR&D Technician

Franks, Frank, Ed. Spec. - Senior EMR&D Specialist

Huff, Roger, MS - EMR&D Associate

Kederis, Cleves, MA - EMR&D Specialist

Leach, Fay, EdD - EMR&D Specialist

McCrimmon, Suella, MA - EMR&D Intern

Morris, June, MS - Behavioral Research Scientist

Murr, Marvin, BA - EMR&D Assistant

Nolan, Carson, PhD - Coordinator; Educational Research, Development, and Reference Group

Pinson, Pamela - Secretary

Pohlman, Jeanne - EMR&D Assistant (summer)

Riley, Judy - Secretary

Yick, Margaret, MA - Visiting teacher on sabbatical leave (fall)

Consultants during Fiscal 1972

Consultants in Primary Level Braille Reading

Miss Freda Henderson, Curriculum Director, Tennessee School for the Blind

Mrs. Estelle Hagood, Instructional Supervisor, Texas School for the Blind

Mrs. Ina Kurzhals, Acting Principal, Utah School for the Blind

Dr. Evelyn Rex, Assistant Professor, Illinois State University, Normal

Mrs. Sara Schell, Resource Teacher, Atlanta Public Schools

Mrs. Marian Anderson, Program for the Visually Handicapped, Savannah, Georgia

Miss Emma Rowe, Teacher, Dade County Public Schools, Miami, Florida

Miss Eleanor Pester, Resource Teacher, Griffith, Indiana

Mrs. Betty Wommack, Instructional Supervisor, Kentucky School for the Blind

Mrs. Jane Wegehoft, Primary Teacher, Illinois Braille and Sight-Saving School

Participants in the Social Studies Institute

Mr. John T. Bennett, Secondary Social Studies Teacher, Indiana School for Blind

Mr. Gary Coker, Principal, Tennessee School for the Blind

Mrs. Mary Nell Council, Elementary Social Studies Teacher, Tennessee School for the Blind

Mrs. Edith Georgi, Elementary Social Studies Teacher, Kentucky School for the Blind

Mrs. Ruth Holmes, Science-Social Studies Teacher, Illinois Braille and Sight Saving School

Dr. Arthur Lown, Project Director, Vision Center, Atlanta Public Schools, Georgia

Dr. Willard Smith, Department of Education, George Peabody College, Nashville, Tennessee

Participants in the Science Institute

Mr. Norman Anderson, Elementary Science Teacher, Maryland School for the Blind

Miss Annette Bettinger, Elementary Teacher, New York State School for the Blind

Miss Betty Sue Hill, Director, Special Education, Owensboro Public Schools, Kentucky

Mrs. Marian Lewis, Elementary Science Teacher, Tennessee School for the Blind

Mr. Vernon Lustick, Secondary Science Teacher, Missouri School for the Blind

Mrs. Elise Nichols, Elementary Science Teacher, Tennessee School for the Blind

Mrs. Nellie Slaton, Coordinator, Science Program, Frances Blend Elementary School for Blind and Partially Sighted, Los Angeles, California

Consultants in Sound Localization Skill Development Project

M. Bernadette Alber, Resource Teacher of Visually Handicapped, Evanston Township High School, Illinois

Ralph Brewer, Pre-school Counselor, Tennessee School for the Blind

Gary Coker, Principal, Tennessee School for the Blind

Will Evans, Dean of Students, Kentucky School for the Blind

Robert Gockman, Orientation and Mobility Instructor, Edward Hines, Jr. Hospital, Hines, Illinois

Ned Jackson, Orientation and Mobility Instructor, Illinois Braille and Sight Saving School

Individual Consultants

Donald C. Wilson, Secondary Science Teacher, Oak Hill School (simple machines and the light probe)

Mrs. Marian Lewis, Elementary Science Teacher, Tennessee School for the Blind (evaluation of Xerox science materials)

Mrs. Elise Nichols, Elementary Science Teacher, Tennessee School for the Blind (evaluation of the Xerox science materials)

Mrs. Katie N. Sibert, formerly Itinerant Teacher, Stanislaus County California Schools (materials needs of low visioned)

Individual Consultants (continued)

Marcia Wilson, Primary Teacher, Morton Public Schools, Illinois (primary braille reading)

Janet Rader, Primary Teacher, East Peoria Public Schools, Illinois (primary braille reading)